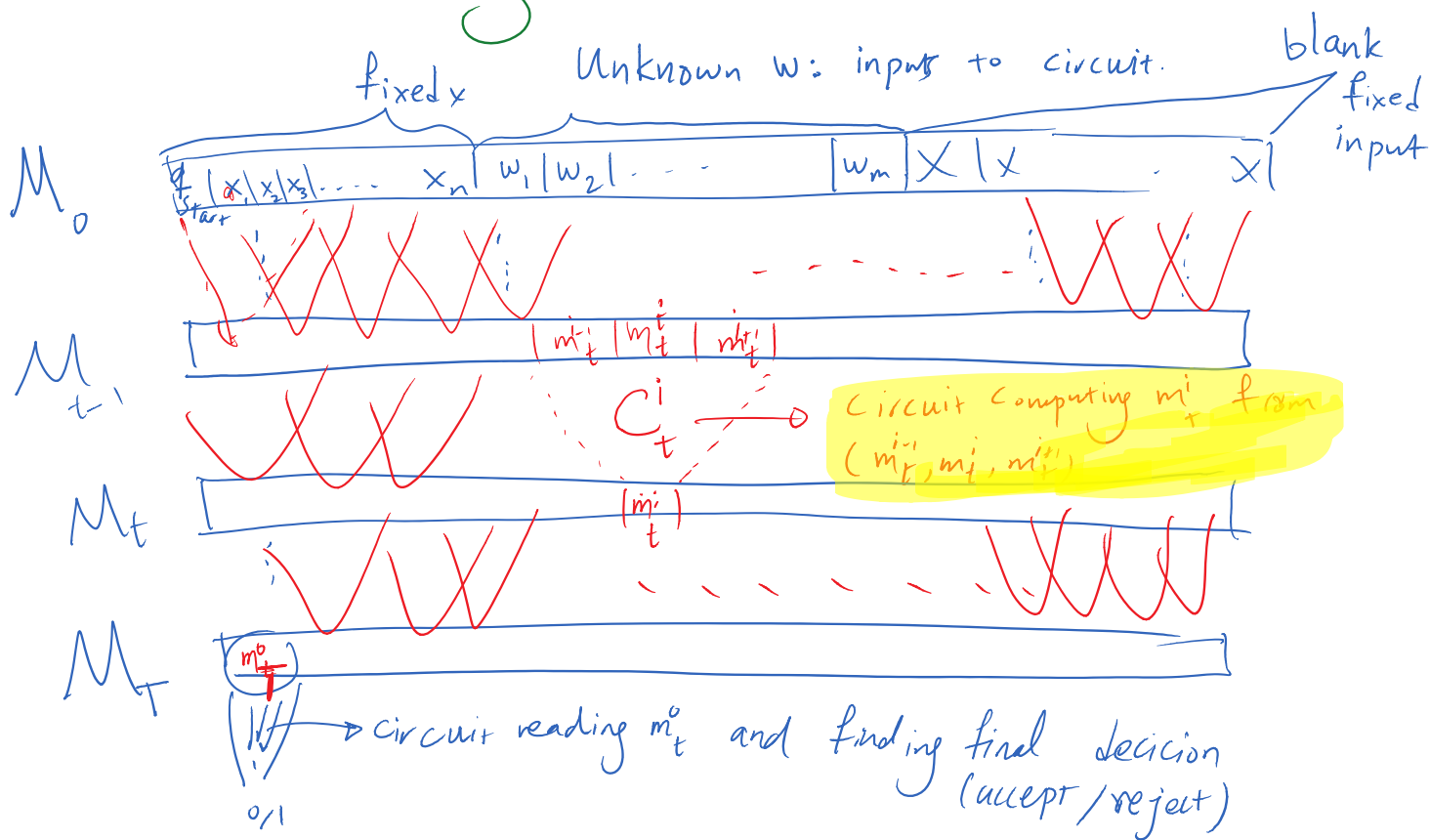


# Cook-Levin Theorem in Picture:

Let  $M$  be Turing machine checking witnesses for  $L \in NP$ .

The reduction from  $L$  to CircSAT will take  $x$  and maps it (efficiently) to a circuit  $C$  such that  $x \in L$  iff  $C$  is satisfiable (i.e.  $C(\alpha) = 1$  for some  $\alpha$ ).

The circuit  $C$  is explained in the note on Piazza has the following forms:



Note that bits of computation done by  $C$  is not needed: for example the first layer can simply ignore what is after " $w$ " because they

are all blank. Also in the last layer we only care about  $m'_T$  not the rest. However, what is important for us is that  $C$  has size  $T^2 \leq \text{poly}(|X|)$  and can be computed in  $\text{poly}(|X|)$  time.